



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/060,945	01/30/2002	John C. Carrick	2376.2004-000	7237

21005 7590 03/14/2007
HAMILTON, BROOK, SMITH & REYNOLDS, P.C.
530 VIRGINIA ROAD
P.O. BOX 9133
CONCORD, MA 01742-9133

EXAMINER

KIM, DAVID S

ART UNIT	PAPER NUMBER
----------	--------------

2613

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/14/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/060,945

Applicant(s)

CARRICK ET AL.

Examiner

David S. Kim

Art Unit

2613

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 December 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-47 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-47 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Drawings

1. Applicant's response to the objection to the drawings in the previous Office Action (mailed on 18 December 2006) is noted and appreciated. Applicant responded by amending claim 26 so that "time-to-frequency transformation" is no longer required to be shown by the drawings. Accordingly, the previous objection is withdrawn.

Claim Objections

2. Applicant's response to the objections to the claims in the previous Office Action (mailed on 18 December 2006) is noted and appreciated. Applicant responded by amending the claims, which overcomes the previous objections.

3. **Claim 26** is objected to under 37 CFR 1.75 as being a substantial duplicate of claim 25. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Art Unit: 2613

6. **Claims 1-4, 6-20, 22, and 24-47** are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al. (U.S. Patent No. 5,062,703, hereinafter "Wong") in view of Verhoof (EP 0 560 426 A1) and Tomofuji et al. (U.S. Patent No. 5,383,046, hereinafter "Tomofuji").

Regarding claim 1, Wong discloses:

A method for characterizing an optical transmission path in a network with network traffic, the method comprising:

modulating (col. 5, l. 3-18) an optical signal with a pilot tone and outputting the modulated optical signal onto the optical transmission path;

sweeping (col. 5, l. 6) the pilot tone across a frequency range;

detecting amplitudes and phases of the pilot tone along a forward path (e.g., path to 16B in Fig. 3) and a reflected path (e.g., path to 16A in Fig. 3) of the optical transmission path; and

characterizing the optical transmission path based on the detected amplitudes and phases (e.g., Figs. 5A-5B).

Wong does not expressly disclose:

modulating a **data traffic** optical signal with a pilot tone and outputting the modulated optical signal onto the optical transmission path (emphasis Examiner's).

However, it is known to characterize an optical transmission path by modulating an optical signal with data **and** a pilot tone, as shown by Verhoof (information/data "TV" signal in Fig. 1 and measuring signal "MS" pilot tone in Fig. 1). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to incorporate the modulating step of Wong with data **and** a pilot tone, as discussed by Verhoof. One of ordinary skill in the art would have been motivated to do this to allow one to practice the method of Wong in-service so that normal signal transmission service to subscribers continues during the method (Verhoof, col. 1, l. 50-58; col. 2, l. 45-49).

Wong in view of Verhoof does not expressly disclose:

Art Unit: 2613

modulating a data traffic optical signal with a pilot tone and outputting the modulated optical signal onto the optical transmission path (emphasis Examiner's).

Rather, Verhoof shows the modulation of an optical signal with the combined modulating signal of a data traffic signal and a pilot tone (Verhoof, single modulating input to modulator 2 in Fig. 1). This is one known way to modulate an optical signal with a data traffic signal and a pilot tone. However, this kind of modulation is relatively well known in the art. Moreover, there are other known ways to provide this kind of modulation, as shown by Tomofuji (e.g., 8 in Fig. 4, 50 in Fig. 9, 66 in Fig. 13, 67 in Fig. 14, 75 in Fig. 19), including modulation of a data traffic optical signal with a pilot tone (Tomofuji, e.g., 8 in Fig. 4, 66 in Fig. 13). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to implement various ways to modulate an optical signal with a data traffic signal and a pilot tone, including modulation of a data traffic optical signal with a pilot tone. One of ordinary skill in the art would have been motivated to do this to provide at least design flexibility. Moreover, notice that Applicant's own disclosure also discusses multiple ways to modulate an optical signal with a data traffic signal and a pilot tone (Applicant's specification, p. 9, l. 16-23, p. 18-19, bridging paragraph) without highlighting any particular way as a particularly inventive way of doing so. These multiple ways correspond closely to the ways shown in Verhoof and Tomofuji.

Regarding claim 2, Wong in view of Verhoof and Tomofuji discloses:

The method as claimed in claim 1 wherein the characterizing includes determining at least one impairment (Wong, col. 6, l. 4-36) in the optical transmission path.

Regarding claim 3, Wong in view of Verhoof and Tomofuji discloses:

The method as claimed in claim 2 wherein the optical transmission path is a fiber; and the determining includes determining a disconnection, crimp, obstruction, defect, or assembly error (Wong, col. 6, l. 4-36).

Regarding claim 4, Wong in view of Verhoof and Tomofuji discloses:

The method as claimed in claim 1 wherein the characterizing includes determining dispersion in at least a portion of the optical transmission path (Wong, col. 6, l. 4-7).

Regarding claim 6, Wong in view of Verhoof and Tomofuji discloses:

Art Unit: 2613

The method as claimed in claim 1 wherein the detecting is co-located (Wong, e.g., under one reading of “co-location”, notice co-location of 16A and 16B in Figs. 2-3 within the bounds of a local area).

Regarding claim 7, Wong in view of Verhoof and Tomofuji discloses:

The method as claimed in claim 1 wherein the detecting is non-co-located across a length of the optical transmission path having a known characteristic (Wong, e.g., under another reading of “co-location”, notice that 16A and 16B are separate devices in separate locations, non-co-located).

Regarding claim 8, Wong in view of Verhoof and Tomofuji discloses:

The method as claimed in claim 1 wherein the sweeping of the pilot tone maximizes the spatial resolution of the measurements (Wong, col. 11, l. 16-25).

Regarding claim 9, Wong in view of Verhoof and Tomofuji discloses:

The method as claimed in claim 8 wherein the sweeping ranges between about 0.5 MHZ and about 2.5 MHZ (Wong, col. 5, l. 4-18 teaches a range that encompasses this range).

Regarding claim 10, Wong in view of Verhoof and Tomofuji discloses:

The method as claimed in claim 1 wherein the sweeping includes selecting modulation frequencies essentially absent coherent modulations on the optical signal (Wong, the range of col. 5, l. 4-18 includes Applicant's range, which includes modulation frequencies that are essentially absent coherent modulations on the optical signal).

Regarding claim 11, Wong in view of Verhoof and Tomofuji does not expressly disclose:

The method as claimed in claim 1 wherein the detecting of the pilot tone includes filtering the detected optical signal with a bandwidth sufficiently narrow to reject noise while preserving the pilot tone in a manner supporting accuracy requirements.

However, it is known to practice frequency domain reflectometry methods in environments that would employ such filtering. For example, Verhoof teaches the use of frequency domain reflectometry in optical fiber networks. In particular, notice that the reflectometer operates in-service, i.e., during normal signal transmissions (col. 1, l. 50-58). Accordingly, the reflected signal will include the pilot tone and additional spectral components from the normal signal transmissions. At the time the invention was made, it would have been obvious to one of ordinary skill in the art to filter the detected optical signal as

Art Unit: 2613

claimed above. One of ordinary skill in the art would have been motivated to do this to filter out the additional spectral components from the normal signal transmissions, which could interfere with the detection and processing of the desired reflected pilot tone.

Regarding claim 12, Wong in view of Verhoof and Tomofuji teaches a resolution of 1 Hz (Wong, col. 5, l. 5).

Regarding claim 13, Wong in view of Verhoof and Tomofuji teaches filtering through computation (Wong, col. 6, l. 46-59), which implies filtering through a digital processor. Such digital processor filters are known to be adaptable.

Regarding claim 14, Wong in view of Verhoof and Tomofuji discloses:

The method as claimed in claim 1 wherein the characterizing is based on a relative measurement of amplitudes and phases (Wong, note the comparison of the amplitudes and phases in 24 of Fig. 3).

Regarding claim 15, Wong in view of Verhoof and Tomofuji discloses:

The method as claimed in claim 1 wherein the optical transmission path is a fiber (Wong, col. 4, l. 66).

Regarding claim 16, Wong in view of Verhoof and Tomofuji does not expressly disclose:

The method as claimed in claim 1 used in a wavelength division multiplexed or time division multiplexed system.

However, wavelength division multiplexing and time division multiplexing are extremely well known techniques commonly applied in optical fiber networks. At the time the invention was made, it would have been obvious to one of ordinary skill in the art to implement either or both of these techniques in the method of Wong in view of Verhoof and Tomofuji. One of ordinary skill in the art would have been motivated to do this since these techniques are common ways to increase the number of communication channels, which increases the amount of traffic that is transmitted through the network.

Regarding claim 17, claim 17 is an apparatus claim that corresponds largely to the method claim 1. Therefore, the recited steps in method claim 1 read on the corresponding means in apparatus claim 17. Claim 17 also includes limitations absent from claim 1. Wong in view of Verhoof and Tomofuji also discloses these limitations:

Art Unit: 2613

the optical transmission path carrying network traffic (Verhoof, col. 1, l. 50-58).

Regarding claims 18-20, claims 18, 19, and 20 are apparatus claims that introduce limitations that correspond to the limitations introduced by method claims 2, 3, and 4, respectively. Therefore, the recited steps in method claims 2-4 read on the corresponding means in apparatus claims 18-20.

Regarding claim 22, Wong in view of Verhoof and Tomofuji discloses:

The apparatus as claimed in claim 17 wherein the detection unit includes at least one optical detector (Wong, e.g., 16A or 16B in Fig. 3) that senses the pilot tone and provides a corresponding electrical signal.

Regarding claim 24, Wong in view of Verhoof and Tomofuji discloses:

The apparatus as claimed in claim 22 further including at least one receiver coupled to each optical detector to convert the electrical signal to digital data (Wong, implied by “digital signal processing” in col. 5, l. 62-64).

Regarding claim 25, Wong in view of Verhoof and Tomofuji discloses:

The apparatus as claimed in claim 24 wherein the processing unit employs a frequency to time transformation to assist in characterizing the optical transmission path (Wong, Figs. 5A-5B).

Regarding claim 26, Wong in view of Verhoof and Tomofuji discloses:

The apparatus as claimed in claim 24 wherein the processing unit executes a frequency-to-time transformation to assist in characterizing the optical transmission path (Wong, Figs. 5A-5B).

Regarding claims 27-36, claims 27, 28, 29, 30, 31, 32, 33, 34, 35, and 36 are apparatus claims that introduce limitations that correspond to the limitations introduced by method claims 6, 7, 8, 9, 10, 11, 12, 13, 14, and 16, respectively. Therefore, the recited steps in method claims 6-14 and 16 read on the corresponding means in apparatus claims 27-36.

Regarding claim 37, claim 37 is an apparatus claim that introduces limitations that correspond to the limitations introduced by apparatus claim 17. Therefore, the recited means in apparatus claim 17 read on the corresponding means in apparatus claim 37.

Art Unit: 2613

Regarding claim 38, claim 38 is a computer-readable medium claim that introduces limitations that correspond to the limitations introduced by apparatus claim 17. Therefore, the recited means in apparatus claim 17 read on the corresponding steps in computer-readable medium claim 38.

Regarding claims 39-41 and 43-45, claims 39, 40, 41, 43, 44, and 45 are system claims that introduce limitations that correspond to the limitations introduced by claims 17, 18, 20, 31, 15, and 36, respectively. Therefore, the recited limitations in claims 15, 17-18, 20, 31, and 36 read on the corresponding means in system claims 39-41 and 43-45.

Regarding claim 46, Wong in view of Verhoof and Tomofuji discloses:

The method as claimed in claim 1 wherein the modulating includes modulating the amplitude of the data traffic optical signal at about 4% of a total amplitude of the optical signal (Tomofuji, "about 4%" is within the scope of "several percent" known and practiced in the art, col. 1, l. 41, col. 2, l. 14).

Regarding claim 47, claim 47 is an apparatus claim that introduces limitations that correspond to the limitations introduced by method claim 46. Therefore, the recited steps in method claim 46 read on the corresponding means in apparatus claim 47.

7. **Claims 5, 21, and 42** are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong in view of Verhoof and Tomofuji, further in view of Akiyama et al. (U.S. Patent No. 5,982,530, hereinafter "Akiyama").

Regarding claim 5, Wong in view of Verhoof and Tomofuji does not expressly disclose:

The method as claimed in claim 4 further including automatically correcting the dispersion.

However, automatic correction of dispersion is a well-known technique in the art. For example, Akiyama teaches such automatic correction after the dispersion is measured (Akiyama, e.g., Figs. 21(A)-(B), 22(A)-(B), 24(A)-(B), 25(A)-(B), 26, 27(A)-(B)). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to implement some means for automatically correcting the dispersion detected by Wong in view of Verhoof and Tomofuji. One of ordinary skill in the art would have been motivated to do this since dispersion can change with time (Akiyama, col. 2, l. 19-24). Automatic correction provides precise compensation (Akiyama, e.g., col. 32, l. 5-13), which facilitates higher transmission speeds (Akiyama, col. 1, l. 56-62; col. 32, l. 5-13).

Art Unit: 2613

Regarding claims 21 and 42, claims 21 and 42 are claims that introduce limitations that correspond to the limitations introduced by method claim 5. Therefore, the recited steps in method claim 5 read on the corresponding means in claims 21 and 42.

8. **Claim 23** is rejected under 35 U.S.C. 103(a) as being unpatentable over Wong in view of Verhoof and Tomofuji, as applied to claim 22 above, and further in view of Lemus et al. (U.S. Patent No. 6,111,676, hereinafter "Lemus").

Regarding claim 23, Wong in view of Verhoof and Tomofuji teaches:

The apparatus as claimed in claim 22 further including a dual coupler (Wong, e.g., 26 in Fig. 3) coupled to the optical transmission path and connected to each optical detector, wherein the dual coupler provides between about 2% and 5% (known in the art, as shown by Lemus, col. 4, l. 16-19) of the optical signal to the at least one optical detector.

Response to Arguments

9. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection. Applicant's arguments are based on the new limitation(s) introduced by Applicant's most recent amendment filed on 18 December 2006. The new limitation(s) are addressed the application of newly applied Verhoof and Tomofuji. Accordingly, Applicant's arguments are moot.

Conclusion

10. The references made of record and not relied upon are considered pertinent to applicant's disclosure. Lautenschlager is cited to show a test signal/pilot tone modulated on top of a data signal for modulating an optical signal (Fig. 2). Harres is cited to show a low-amplitude health signal/pilot tone combined with a main data signal to modulate an optical signal (Figs. 1-2). Roberts is cited to show a data signal modulated on top of a dither/pilot tone-modulated optical signal (e.g., Fig. 2). Tajima et al. is cited to show the modulation of an optical signal by superimposing a sub-information signal/pilot tone over a digital main/data signal (e.g., Figs. 1-5). Jensen et al. is cited to show the application of a pilot tone on top of a data signal in an optical system (p. 275, col. 1, 1st full paragraph). Newton is cited to show various teachings about optical frequency domain reflectometry (p. 332+).

Art Unit: 2613

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Kim whose telephone number is 571-272-3033. The examiner can normally be reached on Mon.-Fri. 9 AM to 5 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth N. Vanderpuye can be reached on 571-272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DSK


KENNETH VANDERPUYE
SUPERVISORY PATENT EXAMINER